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(71) Applicant: QUALCOMM INCORPORATED [US/US]; 6455 Lusk Boulevard, San Diego, CA 92121 (US).

(72) Inventor: WEAVER, Lindsay, A., Jr.; 1162 Cherryvale Road, Boulder, CO 80303 (US).

(74) Agents: MILLER, Russell, B. et al.; Qualcomm Incorporated, 6455 Lusk Boulevard, San Diego, CA 92121 (US).

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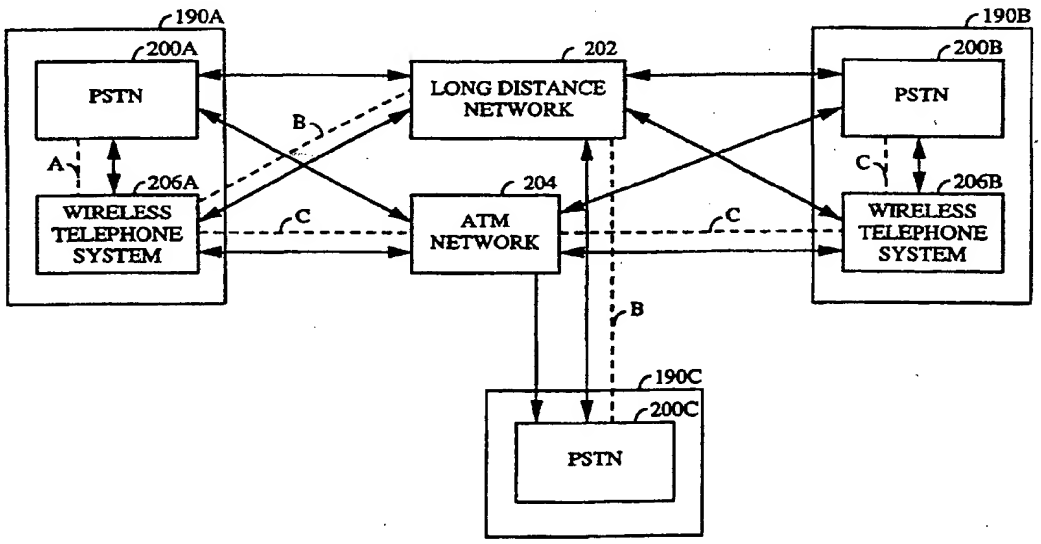

(57) Abstract

A wireless telephone system (106) having digital signal processing capability determines if a telephone call is directed to a public switched telephone network (100) (PSTN) located within a local calling area having another wireless telephone system. If so, an asynchronous transfer mode (ATM) or other packet based link (104) is established between the two wireless telephone systems, and vocoded audio information is transmitted over that ATM link. Upon reaching the second wireless telephone system the vocoded audio information is converted by the second wireless telephone system (106) into pulse code modulation (PCM) encoded audio information, and introduced into the PSTN (100). On the reverse path, PCM formatted data from the receiving PSTN (100) is converted into vocoded audio information by the second wireless telephone system (106), and then transmitted to the first wireless telephone system (106) via the ATM or other packet based link (104).

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REMOTE VOCODING OVER A LONG DISTANCE LINK

BACKGROUND OF THE INVENTION

I. Field of the Invention

The present invention relates to telecommunications. More particularly, the present invention relates to a method and system for interfacing a digital network with a public switched telephone system.

II. Description of the Related Art

Fig. 1 is a block diagram of typical telephone network. Local calling area **90(a)** is comprised of public switched telephone network (PSTN) **100(a)** and wireless telephone system **106(a)**, and local calling area **90(b)** is comprised of PSTN **100(b)** and wireless telephone system **106(b)**. Wireless telephone systems **106** provide mobile telephone service and PSTN's **100(a)** and **(b)** provide stationary telephone service within their respective local calling areas **90**. Long distance network **102** and asynchronous transfer mode (ATM) network **104** are coupled to PSTN's **100(a)** and **(b)** as well as wireless telephone systems **106(a)** and **(b)**, and provide long distance telecommunication service between local calling areas **90(a)** and **(b)**. ATM network **104** provides long distance telecommunication service via high speed packet based connections, and long distance network **102** provides long distance telecommunication service via dedicated connections.

In general, any audio information associated with the telephone calls carried by wireless telephone systems **106** is digitally encoded via a process called vocoding, and any audio information associated with telephone calls carried by PSTN's **100** is digitally encoded via a process called pulse code modulation (PCM). Vocoding is far more efficient than PCM, but requires substantially greater signal processing resources to perform. The signal processing resources are required during both the initial vocoding of the audio information, and when the audio information is devocoded for purposes of regeneration of that audio information. Wireless telephone systems **106(a)** and **(b)** utilize vocoding because they conduct telephone calls using radio frequency (RF) signals and the amount of RF bandwidth

available for conducting these telephone calls is limited. Therefore, efficiency within wireless telephone systems **106** is critical. PSTN's **100** have no such bandwidth limitation, and therefore the cost of the additional signal processing resources required by vocoding is usually not justified.

During a telephone call between a PSTN **100** and a wireless telephone system **106**, the digitally encoded audio information must be exchanged between the two systems. Accordingly, the encoding method must be converted from vocoding to PCM, and vice-versa, so that each system will be able to properly regenerate the audio information. Presently, this conversion is performed within the wireless telephone systems **106** just before, and just after, the data crosses over between the two systems, depending on the direction of the data flow. The conversion is performed within wireless telephone systems **106** because that is where the necessary signal processing resources are located, and because PSTN's **100** generally do not possess such signal processing resources.

In an exemplary telephone call from wireless telephone system **106(a)** directed to a receiving PSTN **100**, vocoded audio information leaving wireless telephone system **106(a)** is devocoded before being introduced into one of the other telecommunication systems for purposes of routing. These other telecommunication systems include PSTN **100(a)**, which is used for local telephone calls, as well as long distance network **102** and ATM network **104**, which are used for long distance telephone calls. Long distance telephone calls may also be introduced into long distance network **102** or ATM network **104** by way of PSTN **100(a)**. On the reverse path, PCM encoded audio information from a PSTN **100** arriving at wireless telephone system **106(a)** via one of these other telecommunication systems is converted to vocoded audio information before being further processed within wireless telephone system **106(a)**.

For many telephone calls the method of processing the associated audio information described above is inefficient. This is because the digitally encoded audio information is encoded via the less efficient PCM method for the majority of path through which it travels, and therefore is encoded via less efficient PCM for a majority of the time. This is especially true for long distance telephone calls which are carried outside wireless telephone systems **200** for almost the entire transmission. An improved method of processing a telephone call would allow the audio information to remain in vocoded format for a greater portion of the time, thereby decreasing the amount of network resources consumed by the telephone call

and reducing the cost. Therefore, a need exists for an improved method and system for interfacing a wireless telephone system with other telephone networks.

SUMMARY OF THE INVENTION

The present invention is a novel and improved method and system for interfacing a digital network with a public switched telephone network. In accordance with one embodiment of the invention a first wireless telephone system determines if a telephone call is directed to a public switched telephone network (PSTN) located within a local calling area having another wireless telephone system. If so, an asynchronous transfer mode (ATM) or other packet based link is established between the two wireless telephone systems, and vocoded audio information is transmitted over that ATM link. Upon reaching the second wireless telephone system the vocoded audio information is converted by the second wireless telephone system into pulse code modulation (PCM) encoded audio information, and introduced into the PSTN. On the reverse path, PCM formatted data from the receiving PSTN is converted into vocoded audio information by the second wireless telephone system, and then transmitted to the first wireless telephone system via the ATM or other packet based link.

BRIEF DESCRIPTION OF THE DRAWINGS

The features, objects, and advantages of the present invention will become more apparent from the detailed description set forth below when taken in conjunction with the drawings in which like reference characters identify correspondingly throughout and wherein:

Fig. 1 is a block diagram of a telephone network;

Fig. 2 is a block diagram of a telephone network illustrating the routing of telephone calls in accordance with one embodiment of the invention; and

Fig. 3 is a block diagram of a cellular telephone system configured in accordance with one embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following description of an exemplary embodiment of the present invention various systems and configuration are specifically described. These systems include an asynchronous transfer mode (ATM) network and a wireless telephone system located within the same local calling area as a receiving public switched telephone network (PSTN). It will be apparent to one skilled in the art that the use of other systems having similar functionality is consistent with the use of the present invention. For example, the use of other packet based networks or other networks which can allocate telecommunications resources between various telephone calls in place of an ATM network is consistent with the operation of the present invention. Additionally, the use of any telecommunications signal processing system that can route and convert vocoded audio information to PCM encoded audio information instead of another wireless telephone system is also consistent with the present invention. Furthermore, the present invention is described in the context of a wireless telephone system. It will be apparent to one skilled in the art that the present invention may be used within other digital networks that encode audio and other information in a highly efficient manner when compared to the systems with which they interact. In other cases throughout the disclosure, well known systems are shown in block form. This is done in order to avoid unnecessarily obscuring the disclosure of the present invention.

Fig. 2 is a block diagram of a telephone network configured in accordance with one embodiment of the invention. Local call area **190(a)** is comprised of PSTN **200(a)** and wireless telephone system **206(a)**, and local calling area **190(b)** is comprised of PSTN **200(b)** and wireless telephone system **206(b)**. Local calling area **190(c)** is comprised of PSTN **200(c)**. Wireless telephone systems **206** provides mobile telephone service and PSTN's **200** provide stationary telephone service within their respective local calling areas **190**. Long distance network **202** and ATM network **204** are

coupled to PSTN's **200(a)**, **(b)** and **(c)**, as well as wireless telephone systems **206(a)** and **(b)**, and provide long distance communication services between local calling areas **190(a)** - **(c)**. ATM network **204** provides long distance telecommunications services using high speed data packets and long distance network **202** provides long distance telecommunications services via dedicated connections. In general, a local calling area **190** is defined by physical proximity, however, other definitions are contemplated including area code, reduced cost for exchanging information, and ability to transfer information without the use of a long distance telecommunications service.

Dashed line **(A)** illustrates an exemplary telephone call between wireless telephone system **206(a)** and PSTN **200(a)**, which is a local telephone call. Audio information from wireless telephone system **206(a)** is encoded via vocoding while it is transported within wireless telephone system **206(a)**. Before being introduced into PSTN **200(a)**, the method of encoding is converted from vocoding to PCM within wireless telephone system **206(a)** and the PCM vocoded audio information is passed into PSTN **200(a)** where it is used to generate audio information. On the reverse path, audio information from PSTN **200(a)** is encoded via PCM and the PCM encoded audio information is transmitted via path **(A)** into wireless telephone system **206(a)**. Upon entering wireless telephone system **206(a)** the PCM encoded audio information is converted into vocoded audio information for further transport within wireless telephone system **206(a)**.

Dashed line **(B)** indicates the path of an exemplary long distance telephone call between wireless telephone system **206(a)** and PSTN **200(c)**. During the telephone call, vocoded audio information generated within wireless telephone system **206(a)** is converted into PCM encoded audio information before being introduced into long distance network **202**. Long distance network **202** then passes the PCM encoded audio information to PSTN **200(c)** where it is used to generate audio information. On the reverse path, PCM encoded audio information from PSTN **200(c)** is transmitted via long distance network to wireless telephone system **206(a)**. Wireless telephone system **206(a)** converts the PCM encoded audio information to vocoded audio information for further transport and processing within wireless telephone system **206(a)**.

To set up the telephone call indicated by dashed line **(B)**, wireless telephone system **206(a)** first determines that the telephone call is directed to local calling area **190(c)**. Additionally, wireless telephone system **206(a)** determines that another wireless telephone system **206** is not located within

local calling area 190(c). In response to these determinations, wireless telephone system 206(a) elects to convert the vocoded audio information into PCM encoded audio information before introducing the audio information into long distance network 202, so that is may be properly processed when received by PSTN 200(c). Additionally, wireless telephone system 206(a) selects long distance network 202 to route the telephone call to PSTN 200(c). In alternative embodiments of the invention the call may also be routed through PSTN 200(a) and long distance network 202 to PSTN 200(c), or via ATM network 204.

Dashed line (C) indicates the path of a second exemplary long distance telephone call between wireless telephone system 206(a) and PSTN 200(b). During the telephone call vocoded audio information from wireless telephone system 206(a) is transmitted via ATM network 204 to wireless telephone system 206(b) where it is used to generate audio information. Wireless telephone system 206(b) converts the vocoded audio information to PCM encoded audio information and transmits the PCM encoded audio information to PSTN 200(b). On the reverse path, PCM encoded audio information from PSTN 200(b) is transmitted to wireless telephone system 206(b). Wireless telephone system 200(b) converts the PCM encoded audio information to vocoded audio information and transmits the vocoded audio information to wireless telephone system 206(a) via ATM network 204 for further transmission and processing.

To setup the call indicated by dashed line (C) wireless telephone system 206(a) first determines that the call is directed to a PSTN 200 located with local calling area 190(b), and that wireless telephone system 206(b) is also located within local calling area 190(b). In response to these determinations, wireless telephone system 206(a) elects to transmit vocoded audio information to wireless telephone system 206(b). Additionally, wireless telephone system 206(a) selects to route the call through ATM network 204 and wireless telephone system 206(b) to PSTN 200(b). Furthermore, wireless telephone system 206(a) notifies wireless telephone system 206(b) of the call directed to PSTN 200(b) and instruct wireless telephone system 206(b) to convert the vocoded audio information into PCM encoded audio information which and to transmitted to PSTN 200(b). This instruction can be implied as part of the notification procedure, or can be performed via the transmission of additional data.

Fig. 3 is block diagram of wireless telephone system 206(a) configured as a cellular telephone system in accordance with one embodiment of the

invention. Subscriber units 300(a) and (b) interface with base stations 302(a) and (b) via radio frequency (RF) signals and transmit and receive digitally encoded audio information. Base stations 302(a) and (b) are coupled to cellular interconnect subsystem (CIS) 304 within base station controller (BSC) 306. Call control processor (CCP) 308 is coupled to CIS 304 and home location register (HLR) 310. Selector system 312 selects between the multiple signals that arrive from a subscriber unit 300 in a soft hand-off situation and is coupled to CIS 304 and signal processing system 314. PSTN interface 316 is coupled to PSTN 200(a) of Fig. 2 and ATM interface 318 is coupled to ATM network 204 of Fig. 2 and both interface systems are coupled to signal processing system 314.

In an exemplary telephone call initiated by subscriber unit 300(a), a call request including an associated telephone number is generated by subscriber unit 300(a) and transmitted via base station 302(a) and CIS 304 to CCP 308. CCP 308 makes various determinations about the telephone call using HLR 310 based on the associated telephone number. HLR 310 is a data base that stores information about the various local calling areas 190. In the preferred embodiment this information including the area code of each local calling area and whether another wireless telephone systems 206 or other telecommunications signal processing system having compatible vocoding capability is located within that local calling area 190. HLR 310 may also contain information regarding the various exchange codes located within each local calling area and the proximity of the associated exchanges to another wireless telephone system 206. Using HLR 310, CCP 308 first determines if the telephone call is local or long distance. Secondly, CCP 308 determines if the call is directed to a PSTN 200 or to a another wireless telephone system 206. If the call is long instance and directed to a PSTN 200 then CCP 308 further determines if a wireless telephone system 206 is located within the same local calling area 190 as the receiving PSTN 200. Based on these determinations, CCP 308 takes a variety of actions during call setup in order to establish a telephone call in accordance with the present invention.

If CCP 308 determines that wireless subscriber unit 300(a) is requesting a long distance call directed to a PSTN 200 and that a second wireless telephone system 206 is located within the same local calling area as the receiving PSTN 200, it establishes a link to that wireless telephone system 206 via ATM network 204. Additionally, CCP 308 instructs the second wireless telephone system 206 to establish a connection with the receiving

PSTN 200, and to prepare to receive vocoded audio information and to convert that vocoded audio information into PCM encoded information before transmitting that PCM encoded audio information to PSTN 200. Additionally, CCP 308 instructs the second wireless telephone system 206 to convert PCM encoded audio information from the receiving PSTN 200 into vocoded audio information before transmitting that vocoded audio information over to ATM network 204. As described above, this instruction can be implied as part of the notification procedure, or can be performed via the transmission of additional data. CCP 308 also configures CIS 304, selector system 312 and signal processing system 314 to pass vocoded audio information from subscriber unit 300(a) to ATM interface 318 which in turn directs the vocoded audio information to ATM network 204. Vocoded audio information received via ATM interface 318 associated with the exemplary telephone call is passed through signal processing system 314, selector system 312, and CIS 304 before being passed to subscriber unit 300(a) via base transceiver station 302(a).

If CCP 308 determines that wireless subscriber unit 300(a) is requesting a long distance call that is directed to a PSTN 200 within a local calling area 190 lacking a wireless telephone system 206, a connection to the receiving PSTN 200 is established through long distance network 202 of Fig 2. To process the call, CCP 308 configures CIS 304 to pass the audio information to signal processing system 314 via selection system 312. CCP 308 also configures signal processing system 304 to convert the vocoded audio information into PCM encoded audio information and to transmit that PCM encoded audio information into long distance network interface 320. In alternative embodiments of the invention signal processing system 314 may be configured to pass the vocoded audio information to pass the PSTN interface 316 which routes the data to long distance network 202 through PSTN 200(a) of Fig 2. In the reverse direction, PCM encoded audio information from the receiving PSTN 200 is transmitted through long distance network 202 of Fig. 2 and long distance network interface 320 to signal processing system 314. Signal processing system 314 is further configured by CCP 308 to convert the PCM encoded audio information into vocoded audio information, and to transmit that data to subscriber unit 300(a) via selector system 312, CIS 304, and base transceiver station 302(a).

If CCP 308 determines that a local call to PSTN 200(a) has been requested by wireless subscriber unit 300(a) (Fig. 2) it configures signal processing system 314 to convert the vocoded audio information from

subscriber unit 300(a) to PCM encoded audio information and to transmit that PCM encoded audio information to PSTN interface 316. PSTN interface 316 proceeds to transmit the PCM encoded audio information to PSTN 200(a). In the reverse direction, PCM encoded audio information from PSTN 200(a) is received by PSTN interface 316 which transmits the data to signal processing system 314. Signal processing system 314 converts the PCM encoded audio information into vocoded audio information and transmits that vocoded audio information to subscriber unit 300(a) via selector system 312, CIS 304, and base transceiver station 302(a).

When another wireless telephone system 206 initiates a telephone call directed to PSTN 200(a), and notification of that telephone call is received by wireless telephone system 206(a), that notification is directed to CCP 308. CCP responds by establishing a connection to PSTN 200(a) via PSTN interface 316, and configuring ATM interface 318 to direct vocoded audio information from the requesting wireless telephone system associated with the telephone call to signal processing system 314. Additionally, CCP 308 configures signal processing system 314 to convert the vocoded audio information received from ATM interface 318 and associated with the telephone call to PCM encoded audio information and to pass the PCM encoded audio information to the receiving PSTN 200 via PSTN interface 316. On the reverse path, PCM encoded audio information from the receiving PSTN 200 is transmitted to signal processing system 314 via PSTN interface 316. CCP also configures signal processing system 314 to convert the PCM encoded audio information into vocoded audio information, and to pass that vocoded audio information to ATM interface 318 which transmits the vocoded audio information to the requesting wireless telephone system 206 via ATM network 204 of Fig. 2.

By processing telephone calls in the above described manner, wireless telephone system 206(a) more efficiently interfaces with other telephone networks. This is because data is transmitted over the long distance ATM network 204 in the more efficient vocoded format for long distance telephone calls directed a PSTN 200 located within a local calling area 190 also having a wireless telephone system 206, and therefore conserves long distance network resources. Additionally, by transmitting this vocoded audio information over ATM network 204, or another packet based network, the benefit of using the more efficiently vocoded audio information format is realized to a greater extent. This is because ATM network 204 is a packet based network which more efficiently allocates the

available network resources between the various telephone calls and other communication sessions it carries. This is in contrast to dedicated connection systems which utilize network resources during a telephone call whether data is being transmitted or not. By using vocoded audio information during the course of the long distance transmission via the ATM network **204** the number of packets necessary to conduct the telephone call is substantially reduced over the use of PCM encoded audio information thereby freeing up network capacity for other telephone calls, and reducing the cost of the telephone call for either the wireless telephone service subscriber, the wireless telephone system operator, or both.

Thus an improved method and system for interfacing a wireless telephone system with a telephone network is described. Alternative embodiments of the invention will be apparent to one skilled in the art. The exemplary embodiment provided is merely for purposes of illustration and should not be construed as limiting the scope of the invention.

I CLAIM:

CLAIMS

1. A wireless telephone system located in a local calling area comprising:

a signal processing system;

a signal transmission system; and

a call processing system for receiving a telephone call request and for determining that said telephone call request is directed to a public switched telephone network located in a second local calling area, for determining that a telecommunications signal processing system is also located in said second local calling area, and for configuring said signal processing system and said signal transmission system to transmit vocoded audio information associated with said telephone call request to said telecommunications signal processing system.

2. The wireless telephone system as set forth in claim 1 wherein said call processing system further determines that a packet based network connection exists between said wireless telephone system and said telecommunications signal processing system, and wherein said vocoded audio information is transmitted via said packet based network connection.

3. The wireless telephone system as set forth in claim 2 wherein said call processing system notifies said telecommunications signal processing system of said telephone call request directed to said public switched telephone network located within second local calling area.

4. The wireless telephone system as set forth in claim 3 wherein said call processing system instructs said telecommunications signal processing system to convert said vocoded audio information to non-vocoded audio information, and to pass said non-vocoded audio information to said public switched telephone network.

5. The wireless telephone system as set forth in claim 2 wherein said packet based network connection is a asynchronous transfer mode network connection.

6. The wireless telephone system as set forth in claim 1 further comprising:

a data base for storing a set of local calling areas, and whether a telecommunications signal processing system is located each local calling area in said set of local calling area.

7. The wireless telephone system as set forth in claim 6 wherein said data base further stores area codes associated with said local calling area.

8. The wireless telephone system as set forth in claim 1 wherein said local calling area is defined as a location from which audio information may be transmitted to said public switched telephone network at less cost than from said wireless telephone system.

9. The wireless telephone system as set forth in claim 1 wherein said local calling area is defined as a location from which audio information may be transmitted to said public switched telecommunications network without the use of a long distance telecommunications service.

10 The wireless telephone system as set forth in claim 1 further comprising:

a subscriber unit for generating said telephone call request.

11 The wireless telephone system as set forth in claim 1 wherein said telecommunications signal processing system is a second wireless telephone system.

12 A method for processing a telephone call within a wireless telephone system having a subscriber unit comprising the steps of:

(a) receiving a telephone call request from said subscriber unit;

(b) determining that said call request is directed to a public switched telephone network;

(c) determining that said public switched telephone network is located in a different local calling area than said wireless telephone system;

(d) determining that a telecommunications signal processing resource is located in said different local calling area;

(e) notifying said second wireless telephone system of said telephone call request; and

(f) transmitting vocoded audio information to said second wireless telephone system.

13. The method as set forth in claim 12 further comprising the steps of:

determining that a packet based connection is available between said wireless telephone system and said second wireless telephone system; and

transmitting said vocoded audio information via said packet based connection.

14. The method as set forth in claim 12 wherein:

said telephone call request includes a telephone number; and

steps (b), (c) and (d) are performed using said telephone number.

15. The method as set forth in claim 12 further comprising the step of:

storing a set of area codes associated with a set of telecommunications signal processing systems.

16. The method as set forth in claim 15 further comprising the step of:

storing a set of exchange codes associated with said area codes that are also associated with said set of telecommunications signal processing systems.

17. The method as set forth in claim 12 wherein said set of telecommunications signal processing system is a set of wireless telephone systems.

18. A method for processing telephone calls comprising the steps of:

(a) transmitting vocoded audio information from a first wireless telephone system to a telecommunications signal processing system via a packet based network;

(b) devocoding said vocoded audio information at said telecommunications signal processing system thereby generating devocoded audio information; and

(c) transmitting said audio information to a public switched telephone network.

19. The method as set forth in claim 18 further comprising the steps of:

receiving a request to initiate a telephone call from a subscriber unit that is part of said first wireless telephone system;

determining if said telephone call is directed to said public switched telephone network; and

determining if said telecommunications signal processing systems can transmit audio information to said public switched telephone network at less cost than said wireless telephone system.

20. The method as set forth in claim 19 further comprising the steps of:

receiving non-vocoded audio information from said public switched telephone network;

vocoding said non-vocoded audio information using said telecommunications signal processing resources thereby generating vocoded audio information; and

transmitting said vocoded audio information to said wireless telephone system via said ATM network.

21. A method for processing telephone calls within a wireless telephone system having a subscriber unit and employing vocoding comprising the steps of:

(a) receiving a telephone call request from said subscriber unit;

(b) determining that said telephone call request is directed to a public switched telephone network located in a local calling area and that a second wireless telephone system is located within said local calling area;

(c) transmitting vocoded audio information to said second wireless telephone system;

(d) devocoding said vocoded audio information at said second wireless telephone system thereby generating devocoded audio information; and

(e) transmitting said devocoded audio information to said public switched telephone network.

22. The method as set forth in claim 21 further comprising the step of:

instructing said second wireless telephone system to establish a connection with said public switched telephone network.

23. The method as set forth in claim 21 further comprising the steps of:

(f) receiving non-vocoded reverse path audio information from said public switched telephone network;

(g) vocoding said non-vocoded reverse path audio information in said second wireless telephone system thereby generating vocoded reverse path audio information; and

(h) transmitting said vocoded reverse path audio information to said wireless telephone system.

24. The method as set forth in claim 21 wherein step (e) is comprised of the step of:

transmitting said vocoded audio information via a packet based network.

25. The method as set forth in claim 21 where said non-vocoded audio information is pulse code modulation encoded audio information.

26. A telecommunications signal processing system located in a local calling area comprising:

a signal processing subsystem;

a signal routing system; and

a control system for receiving notification of a telephone call from a wireless subscriber system located in a different local calling area directed to a public switched telephone system located in said local calling area, and for configuring said signal processing system to convert vocoded audio information associated with said telephone call from said wireless telephone system into non-vocoded audio information, and for configuring said signal routing system to route said audio information to said public switched telephone system.

27. The telecommunications signal processing system as set forth in claim 26 wherein said control system further configures said signal processing system to convert pulse code modulation encoded reverse path audio information from said public switched telephone network associated

with said telephone call into vocoded reverse path audio information, and for configuring said signal routing system to route said vocoded reverse path audio information to said wireless telephone system.

28. The telecommunications signal processing system as set forth in claim 27 wherein said signal routing system routes said vocoded audio information via a packet based network.

29. A telecommunications network comprising:

a wireless telephone system for generating vocoded forward path audio information associated with a telephone call ;

a public switched telephone network for generating pulse code modulation encoded reverse path audio information associated with said telephone call ; and

a telecommunications signal processing system for converting said vocoded forward path audio information into pulse code modulation encoded forward path audio information, and for converting pulse code modulation encoded reverse path audio information into vocoded reverse path audio information.

30. The telecommunications network as set forth in claim 29 further comprising:

a packet based telecommunication network for transmitting said vocoded forward path audio information and said vocoded reverse path audio information between said wireless telephone system and said telecommunications signal processing system.

31. The telecommunications network as set forth in claim 30 wherein said packet based network is a asynchronous transfer mode network.

32. The telecommunications network as set forth in claim 31 wherein said telecommunications signal processing system is a second wireless telecommunications system.

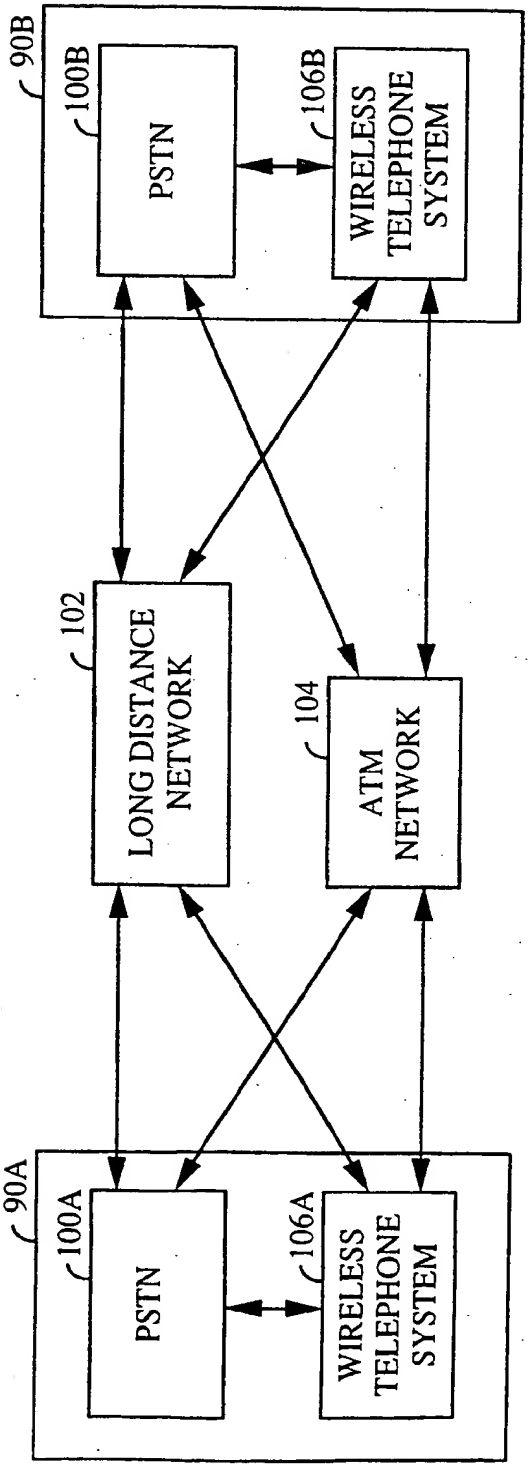
90B
100B
PSTN
106B
WIRELESS TELEPHONE SYSTEM
102
LONG DISTANCE NETWORK
104
ATM NETWORK
90A
100A
PSTN
106A
WIRELESS TELEPHONE SYSTEM

FIG. 1

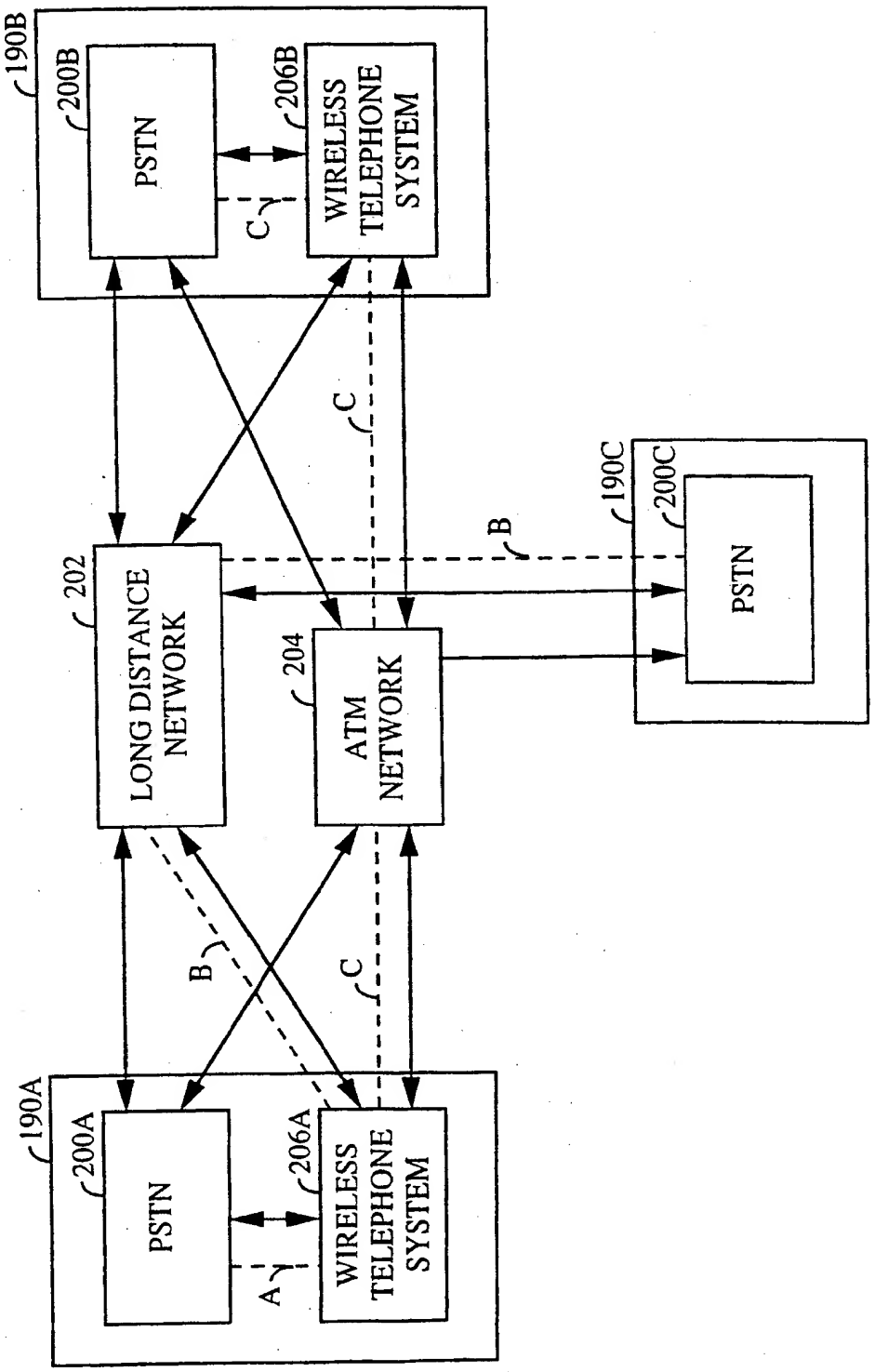
190B
200B
PSTN
206B
WIRELESS TELEPHONE SYSTEM
C
C
B
190C
200C
PSTN
202
LONG DISTANCE NETWORK
204
ATM NETWORK
B
C
190A
200A
PSTN
206A
WIRELESS TELEPHONE SYSTEM
A

FIG. 2

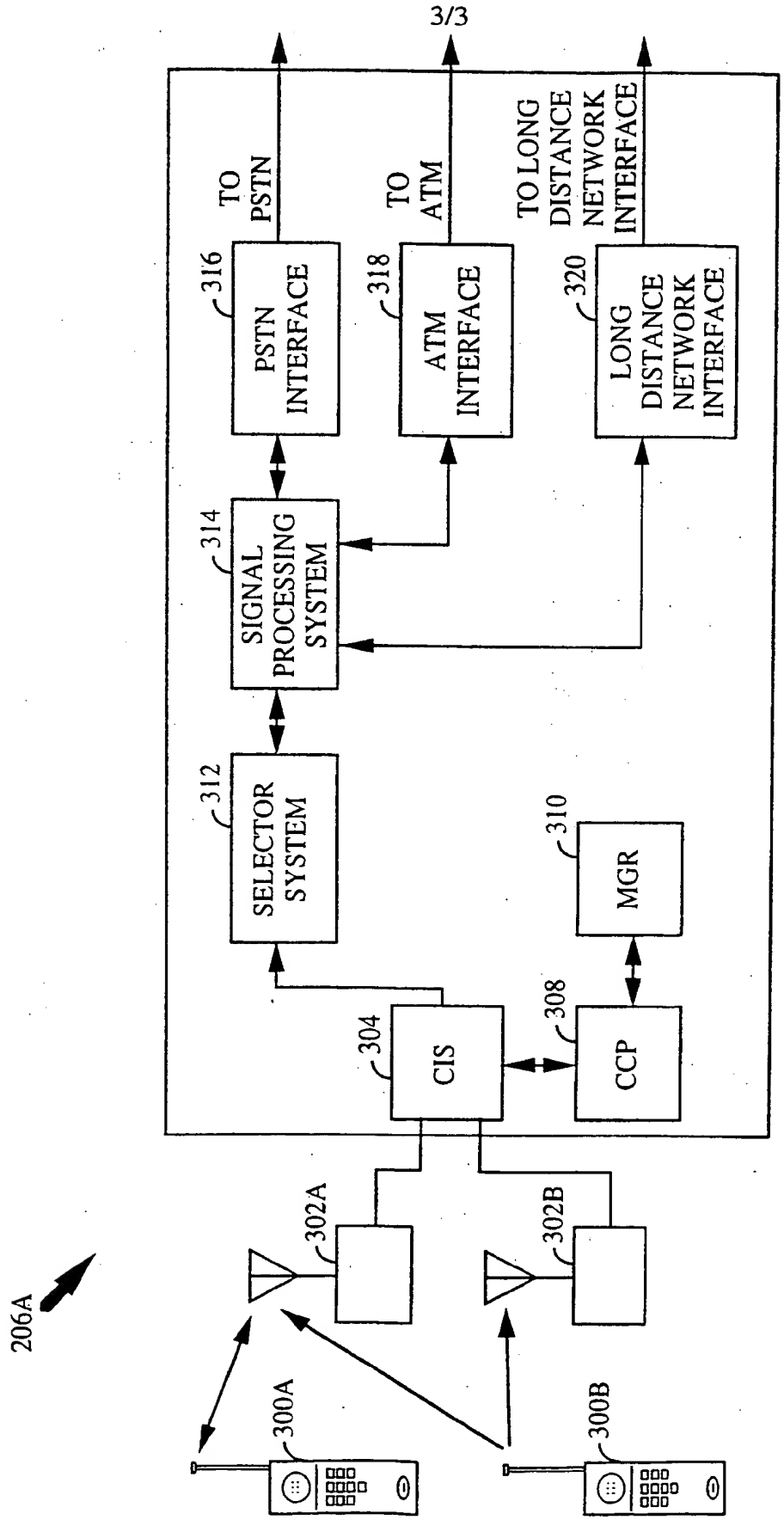
206A
300A
300B
302A
302B
304
CIS
308
CCP
310
MGR
312
SELECTOR SYSTEM
314
SIGNAL PROCESSING SYSTEM
316
PSTN INTERFACE
318
ATM INTERFACE
320
LONG DISTANCE NETWORK INTERFACE
TO PSTN
TO ATM
TO LONG DISTANCE NETWORK INTERFACE

FIG. 3

INTERNATIONAL SEARCH REPORT

Interna· ıl Application No
PCT/US 96/09683

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 0 605 311 A (ALCATEL RADIOTELEPHONE) 6 July 1994 see column 2, line 28 - column 3, line 39 see column 3, line 45 - column 4, line 4 see column 4, line 27 - column 5, line 21 see column 5, line 49 - column 6, line 11 see column 7, line 6 - line 14 ---	1,6,10, 11,26,29 12,18,21
X A	WO 93 00778 A (PLESSEY TELECOMM) 7 January 1993 see page 2, line 8 - line 15 see page 2, line 25 - page 3, line 10 see page 4, line 8 - line 23 --- -/--	18-20, 26-31 1,2,5,12

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 November 1996	12. 11. 96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Gerling, J.C.J.

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INTERNATIONAL SEARCH REPORT

Interna ıl Application No
PCT/US 96/09683

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 522 773 A (AMERICAN TELEPHONE & TELEGRAPH) 13 January 1993 see column 3, line 48 - column 4, line 7 see column 11, line 41 - column 12, line 28 see column 19, line 13 - column 20, line 3 see column 20, line 40 - column 21, line 14 ---	1,12,18, 21,26,29
A	IEICE TRANSACTIONS ON FUNDAMENTALS OF ELECTRONICS, COMMUNICATIONS AND COMPUTER SCIENCES, vol. E75-A, no. 12, 1 December 1992, pages 1702-1709, XP000339157 MASAMI YABUSAKI ET AL: "VOICE COMMUNICATION CONNECTION CONTROL IN DIGITAL PUBLIC LAND MOBILE NETWORKS" see page 1702, right-hand column, paragraph 2. - page 1705, right-hand column, paragraph 5. ---	1,12,18, 21,26,29
A	EP 0 332 345 A (AMERICAN TELEPHONE & TELEGRAPH) 13 September 1989 ---	
X,P	EP 0 664 658 A (AT & T CORP) 26 July 1995 see column 4, line 25 - line 57 see column 6, line 48 - column 7, line 5 see column 7, line 49 - column 8, line 13 see column 9, line 6 - line 29 -----	1,12,18, 21,26,29

INTERNATIONAL SEARCH REPORT

ormation on patent family members

Intern al Application No
PCT/US 96/09683

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